

## Ultra-low Noise, High Bandwidth, 1550nm HgCdTe APD, Phase II

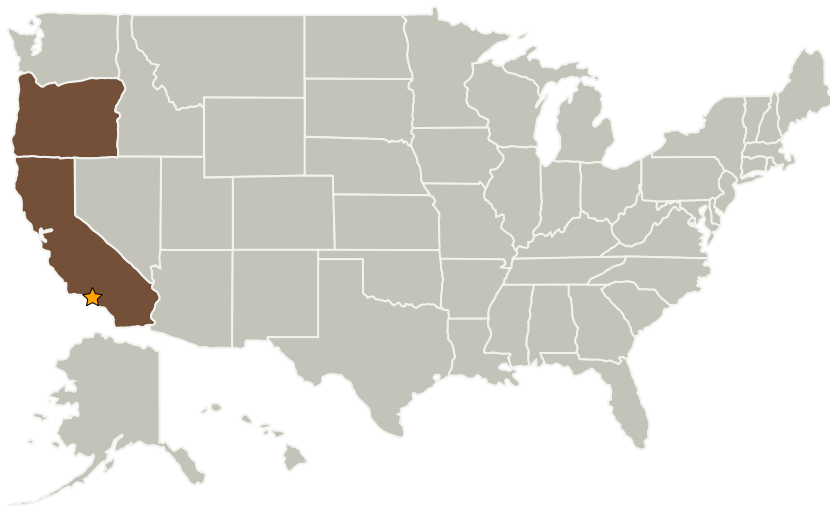
Completed Technology Project (2005 - 2007)



## Project Introduction

To meet the demands of future high-capacity free space optical communications links, a high bandwidth, near infrared (NIR), single photon sensitive optoelectronic receiver will be designed, manufactured, and demonstrated. The unique vertical charge transport electron avalanche photodiode (EAPD) exploits the bandgap properties of HgCdTe to achieve high quantum efficiency and avalanche multiplication that preferentially ionizes electrons to achieve nearly noiseless gain exceeding 1000 with an excess noise factor approaching 1.0 and bandwidths greater than 500 MHz. In Phase II, a segmented 1 mm x 1 mm back-illuminated detector will be integrated with a low noise CMOS integrated circuit to realize a photoreceiver capable of both single photon detection and photon number discrimination. Unlike Geiger Mode detectors, the receiver can operate at 77K, without the limitations of afterpulsing, so that dark current can be reduced and bit error rates reduced. A cold laser line filter is used to select the spectral response anywhere within the 1064-2400 nm spectral band. Optical communications has been identified as a critical technology for future NASA missions, and the innovation satisfied the currently unmet need for a single photon sensitive, large area, high bandwidth NIR photoreceivers that is not served by contemporary approaches.

## Primary U.S. Work Locations and Key Partners



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission  
Directorate (STMD)

### Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

### Responsible Program:

Small Business Innovation  
Research/Small Business Tech  
Transfer

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Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Voxtel, Inc.	Supporting Organization	Industry	Beaverton, Oregon

## Primary U.S. Work Locations

California	Oregon
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## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.1 Detectors and Focal Planes